THE

AMERICAN REVIEW OF TUBERCULOSIS
ABSTRACTS OF TUBERCULOSIS

VOLUME XIX MARCH, 1929 ABST. No. 3

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Phrenicectomy in Pulmonary Tuberculosis.—In the recent awakening of the profession to the possibilities of surgical treatment of tuberculosis, thoracoplasty and phrenicectomy have been most under discussion. In this article the results of experience with 51 cases of phrenicectomy and 84 of thoracoplasty are reviewed and compared. Stuertz appears to have first conceived the possibilities of paralyzing the diaphragm on one side, and he was followed by Sauerbruch who performed phrenicotomy in certain advanced, even bilateral, cases, if the lesion predominated on one side. Schepelmann and Alexander proposed it for early apical tuberculosis and some successes and ameliorations followed these attempts. Later, the restoration of diaphragmatic function after simple section led to the work of Goetze and Felix on phrenic nerve anastomoses and accessories and to important modifications in technique. While Bérard has been doing thoracoplasties since 1913 his first phrenicotomies date only from 1923. Together with Madinier, he saw in phrenicectomy a means of rendering services in unilateral diffuse tuberculosis where for some reason thoracoplasty could not be considered, and also, as did Sauerbruch, of testing the capability of the other lung prior to more radical treatment. It has also been combined with both pneumothorax and thoracoplasty. *Anatomical Considerations:* The trunk of the phrenic nerve rests on the anterior surface of the scalenus anticus muscle, crossing it obliquely. Parallel and internal to it courses the ascending cervical artery, branch of the thyroid axis; more internally is the internal jugular vein. Lodged in the depths of the supraclavicular fossa, the phrenic nerve is covered by the superficial cervical aponeurosis, which is traversed by the external jugular vein, behind the external border of the sternocleidomastoid. Crossing it more deeply is the omohyoid and middle cervical aponeurosis, under which lies some areolar tissue and lymph nodes which may be enlarged and must be carefully dissected free. The anomalies of the phrenic nerve are now well known and variable. There may be a double or even triple phrenic, in addition to the accessory. Its anastomoses with the sympathetic are important. The accessory phrenic joins it at the superior thoracic aperture. Its frequency is estimated at 20 to 30 per cent (Felix), 37 per cent (Sauerbruch), 80 per cent (Goetze). The point of union may be lower but is always above the hilum of the lung. *Physiological Considerations:* Following interruption of its continuity the diaphragm becomes immobilized in expiratory phase, but such immobilization is not absolute, small ripplings occurring as well as inverted movement (Kienbock's phenomenon). With simple phrenicotomy mobility and function are reëstablished after a variable interval, not over four months (Alexander). Experience has established the fact that the only satisfactory technique is one which dissects loose the anastomoses of the nerve with the spinal cord and sympathetic, or breaks the terminal filaments of these anastomoses. The technique devised by

Felix is the model most generally useful. Felix has determined, following its use, an elevation of the diaphragm, which eventually attains from 4 to 8 cm. on the right (depending on the respiratory phase) and 2 to 6 cm. on the left. Bérard has seen as great an elevation as 12 cm. Schlaepfer has noted a progressive atrophy of the muscle, which ends by becoming a parchment-like membrane easily pushed up by the abdominal viscera. Factors which influence phrenicotomy (or phrenicectomy) and its results are the state of the pleuropulmonary lesions, density of the parenchyma, existence of adhesions, and the existence of retractile cicatricial sclerosis. As after thoracoplasty, a fibrous transformation must take place in the pulmonary tissues. Reliable signs of retractile cicatricial sclerosis are a spontaneous falling of the chest wall, and displacement of organs toward the affected side. Hemidiaphragmatic paralysis is of course verifiable by X-ray, but is also evidenced clinically by greatly diminished respiratory murmur and relative immobility of the corresponding base. After resection of the left phrenic the heart is displaced toward the right. The thoracic capacity is reduced to the extent of a quarter or a third of the hemithorax. Sometimes the diaphragmatic position and contour change at once, at other times only secondarily. When there has been a chronic empyema secondary to pneumothorax, the thickness of the pleural shell opposes retraction; the same is true of massive fibrocaseous tuberculosis with a totally adherent lung. *Technique:* The first operations of Bérard followed Goetze's technique, the latest approached that of Felix. Goetze identifies the principal phrenic trunk, frees its connections with the sympathetic as far as the inferior cervical ganglion, resects several cm. of the main trunk and 2 cm. of the nerve to the subclavius. Later he has resected the accessory branches and rolled up the principal nerve on a small metallic tube, for several seconds. Felix tears the nerve loose in such a way that it ruptures beyond the point where joined by its accessory nerves. Felix has calculated that it is necessary to remove a segment of 12-cm. extent. He exposes and picks up the nerve under regional anaesthesia, as does Bérard, preceding this, however, by 1 cgm. of morphine. Exceptionally, general anaesthesia by means of ethyl chloride is employed. The 3rd, 4th, 5th and 6th cervical nerves are anaesthetized by direct injection. The patient ordinarily sits up with his head relaxed. Only a small transverse incision from 3 cm. above the clavicle anteriorly to 6 cm. posteriorly is used. The phrenic nerve is usually easy to identify, lying on the anterior surface of the scalenus anticus and is dissected with a blunt instrument. More than one phrenic may be found. After cutting it, its lower portion is seized with hemostatic forceps and progressive traction employed. One can see the connecting filaments appear and break. Then the lower end of the segment retracted is cut, the wound sutured after attending to hemostasis. *Effects:* Accidents are very rare. Felix has noted haemorrhages from ruptured vessels, with tearing of the upper fibres of the diaphragm. In the presence of adhesions haemorrhage may occur from tearing the pleuropulmonary dome. Alexander mentions grave respiratory reflexes, and Bérard has seen two exacerbations of cervical adenitis, and one case of transitory brachial-plexus paralysis, due to faulty regional anaesthesia. Patients seldom experience dyspnoea and may breathe better and expectorate more easily. In two bilateral cases contralateral exacerbations occurred. Later results have been generally beneficial when not merely symptomatic. Bérard has treated 32 tuberculous patients by simply phrenicectomy, 2 by combined phrenicectomy and pneumothorax, 17 by phrenicectomy combined with total or partial thoracoplasty. Cavities have been reduced over one-half after a few days. The attitude of Dumarest seems rational, to advise phrenicectomy in fibrocaseous or progressive tuberculosis after failure of pneumothorax, when thoracoplasty is not applicable, the end being a symptomatic amelioration of lesions predominating on one side. The greatest permanent successes seem to be in cases of caseous unilateral apical tuberculosis, following Alexander and Schepelmann. A classical indication is to supplement a partial artificial pneumothorax. Dumarest does not believe phrenicectomy of value in a good or complete pneumothorax, but when such a pneumothorax is abandoned it may be of value in limiting too great and painful reëxpansion. Combined with thoracoplasty it probably diminishes the operative risk. It should precede the major operation by 6 to 10 days. The best combination seems to be a phrenicectomy and a partial thoracectomy of 8 or 9 upper ribs. Resection of segments of the lower ribs seems not to be very effective and in the case of basal lesions phrenicectomy should also be done. When all is said, pneumothorax and thoracoplasty remain the great means of pulmonary collapse, with phrenicectomy a supplementary resource not to be underestimated and neglected, but to be used with judgment to produce ameliorations, relieve menacing surgical situations, and in certain carefully selected cases to favor spontaneous cure.

Several instructive diagrams accompany the article.—*La phrénicectomie dans le traitement de la tuberculose pulmonaire, Bérard, Guilleminet and Desjacques, Rev. Belge d. l. Tuberc., March–April, 1927, xviii, 49.—(A. P.)*

Phrenic Exairesis.—The success of artificial pneumothorax has led physicians to resort to surgical measures in cases in which adhesions rendered pneumothorax impossible. Resections of the thorax, however, are associated with quite a high mortality; hence the use of less radical procedures, such as phrenic-nerve exairesis. Theoretically, by provoking paralysis of the hemidiaphragm, this may influence pulmonary lesions in two ways: *1:* By diminishing respiratory activity at the base. *2:* By ascent of the diaphragm, resulting in partial collapse of the lower lobe. Pulmonary rest or diminished activity certainly favors cicatrization of lesions in that part of the lung. But the diaphragm is not entirely paralyzed, and the intercostal muscles continue to be active. When diaphragmatic adhesions exist the object appears to be spontaneously realized in part. A comparison of the results in men and women would be interesting because of the difference in their dominant type of respiration. The rapidity and importance of diaphragmatic displacement are conditioned more or less by the condition of the abdominal muscles and the state of the lung. Normal pulmonary tissue tends to shrink when tension is released, but hepatized and fibrous lesions do this to only a limited degree. Modifications in the blood and lymphatic circulation doubtless play a part, as may sympathetic-nerve influences because of connections with the phrenic. Certainly fibrosis is favored, depending largely on the retractility of pulmonary tissues. Clinically, signs of consolidation, such as increased basal dulness, tubular breathing, and pectoriloquy appear. *Technique:* Exairesis, or radical phrenicectomy, destroying at the same time the accessory phrenic and the subclavicular and sympathetic anastomoses, is preferred to simple section, which is often unsuccessful because of reunion of an accessory phrenic to the principal trunk. About 41 cm. may be extirpated, and at least 12 cm. should be removed. Avulsion gives rise to no serious difficulty unless there are intimate adhesions with the tuberculous organs, (pleura, lymph nodes, etc.). It is generally accompanied by a sharp pain in the shoulder and side, as there are a few sensory fibres. Among operative complications are (1) haemorrhage, (2) reflex cardiorespiratory disturbances, (3) cold-abscess formation, (4) haemoptysis. The nerve may rupture prematurely, in which case the end must be sought and picked up. Haemorrhage is due to wounding of the thyroid axis or phrenic artery. Cold-abscess formation is due to tearing of adherent caseous lymph nodes. The cause of haemoptysis is uncertain. It may depend on intimate adhesions between nerve and lung tissue, or on passive congestion. *Risks* and *Inconveniences:* Most authors agree that the risk of activating lesions of the contralateral lung is minimal, compared with that of thoracoplasty or pneumothorax. Lesions in the upper part of the same lung may, however, be temporarily stirred up. Paraesthesias of the hemithorax occur, but need not cause apprehension. Difficulty in evacuating secretions has never been seen by Moreau and Olbrechts. Keloid degeneration of operative scars is not very uncommon. *Indications:* Those dealing only with pulmonary tuberculosis are here dealt with. The ideal theoretical indication is a lesion limited to the base. In such a case phrenic exairesis is preferable to pneumothorax. Other indications follow: *1:* Impossibility, because of pleural adhesions, of effecting a pneumothorax. *2:* As a substitute for thoracoplasty, in patients in poor condition or unwilling to have major surgery. *3:* In preference to pneumothorax in certain unilateral lesions. *Contraindications: 1:* Exclusively or essentially apical lesions. *2:* Active bilateral lesions. Phrenic exairesis is very useful to precede or supplement pneumothorax or thoracoplasty. Four detailed case reports are appended.—*L'exérèse du nerf phrénique dans le traitement de la tuberculose pulmonaire, J. Moreau and E. Olbrechts, Rev. Belge d. l. Tuberc., March-May, 1926, xvii, 123.—(A. P.)*

Phrenic Exairesis.—The operation of phrenic evulsion in the treatment of pulmonary tuberculosis may be indicated in localized or generalized disease, for the relief of symptoms, for testing the resistance, as an accessory to artificial pneumothorax, and as a preliminary to thoracoplasty. One hundred and five cases have been studied. Phrenic evulsion is a great help in arresting the disease in basal tuberculosis, but is of ittle use in basal bronchiectasis. When the disease is generalized, but mainly unilateral, some improvement may be expected in about 50 per cent of the cases. This improvement has been noticed in bronchiectasis as well as in tuberculosis. As an accessory to incomplete artificial pneumothorax, considerable benefit can be expected in a large percentage of patients, particularly when the base of the lung is adherent to the diaphragm, or when it is desirable to increase the interval between refills. Phrenic evulsion should

always be done before allowing a lung, long collapsed, to reëxpand. Hemidiaphragmatic paralysis will frequently produce complete relief of distressing symptoms which are due to irritation of the muscle or to a drag on the pericardium by adhesions. As bronchiectasis is liable to develop as a sequela of an unresolved pneumonia, phrenic evulsion should be done as a prophylactic measure in all those cases in which resolution is still incomplete three to six months after a basal pneumonia.—*An Endeavor to Assess the Value of Hemidiaphragmatic Paralysis by Evulsion of the Phrenic Nerve in the Treatment of Pulmonary Tuberculosis and Bronchiectasis, a Review of 105 Cases, H. M. Davies, Tubercle, February, 1928, ix, 205.*—(*W. I. W.*)

Phrenic Exairesis.—A critical review of phrenic exairesis is presented, with a personal experience of 33 operated cases, ten of which became free from bacilli a short time after operation.—*Behandlung der Lungentuberkulose mittels Zwerchfell-Lähmung durch Phrenicusexairese, G. Rodenacker, Beitr. z. Klin. d. Tuberk., 1927, lxv, 744.*—(*H. J. C.*)

Phrenic Exairesis for Pulmonary Cavity.—In a cavity case there was already a marked tendency toward contraction, which was decidedly favored by phrenic exairesis, and in the roentgen picture the cavity's shadow diminished to such an extent that only a small remnant remained. Even though the bacilli have not completely disappeared from the sputum, improvement of the general condition and sedimentation reaction was conspicuous.—*Über Phrenicusexairese bei einen Fall von kavernöser Phthise des rechten Oberlappens, J. E. Wolf and H. Lossen, Beitr. z. Klin. d. Tuberk., 1927, lxvi, 719.*—(*H. J. C.*)

Phrenicotomy and Artificial Pneumothorax.—Case report: In a patient with bilateral pulmonary tuberculosis with cavitation, phrenicotomy was done on the less involved side, followed by artificial pneumothorax on the contralateral side, nine days later. Under this treatment, the patient's temperature dropped to normal, the sputum was reduced from 100 to 25 cc., and it became free from bacilli. Physical signs decreased very noticeably.—*Über einen Fall von schwerer doppelseitiger Lungentuberkulose, der links mit Phrenikotomie und rechts mit Pneumothorax mit Erfolg behandelt wurde, H. Maendl, Wien. Klin. Wchnschr., April 19, 1928, xli, 564.*—(*M. P.*)

Results of Pulmonary-Collapse Therapy.—The experience of the author in collapse therapy at the Wald Sanatorium at Davos for the past fifteen years is reported. Most important are the observations on thoracoplasty and pneumothorax, and in addition are recorded those on pneumolysis, local rib resection for freeing adhesions, and phrenic exairesis. Regarding pneumothorax it was found that one-fourth of the cases treated can be considered permanently healed. There were 25 cases on which a total thoracoplasty was performed, and of these 17, or 68 per cent, were healed, and 8, or 32 per cent died. The author prefers the Brauer method. The mishaps are detailed. The results of thoracoplasty excelled those of pneumothorax.—*15 Jahre Lungenkollapstherapie. Ergebnisse und kritische Betrachtungen, H. Jessen, Beitr. z. Klin. d. Tuberk., 1927, lxv, 639.*—(*H. J. C.*)

Artificial Pneumothorax.—This is a statistical presentation of data concerning pneumothorax treatment in various U. S. Veterans Bureau hospitals. A total of 22,948 Veterans Bureau patients were under hospitalization for pulmonary tuberculosis during a period of about two years and two months, and of this number 588, or 2.5 per cent, received pneumothorax treatment. The largest percentage of patients receiving pneumothorax therapy was under treatment for less than one year, and the next largest group was under treatment for one to two years. The good results obtained were in part due to the fact that the patients were coöperative and remained under continual hospital care and observation. The period of time necessary for the observation of tuberculosis patients undergoing pneumothorax therapy depends on a number of factors, such as the general condition of the patient, the extent of the tuberculous lesions in the diseased lung, the condition of the opposite lung, and any complications which may be present or which may arise during the course of treatment. Most of the Bureau patients were placed on pneumothorax therapy after it was found that they failed to improve under other methods of treatment. In a number of cases the treatment was used for the purpose of arresting active or recurrent pulmonary haemorrhages. In a small percentage of cases, this treatment was administered for the purpose of obliterating cavities. The majority of the patients had bilateral lung lesions, and of these almost one-half had less than one-third of the better lung involved. In spite of the distribution of the tuberculous lesions throughout both lungs, excellent results were obtained by this method of treatment. After this statistical study it may be concluded that bilateral involvement is no

contraindication to pneumothorax therapy. This, however, is not in conformity with the teaching of many clinicians. The majority of the patients undergoing this treatment were between the ages of twenty-six and thirty-five. The fact that most of the subjects were within the younger age-groups is probably one reason for the successful outcome. The collapse therapy was controlled by repeated physical examinations as well as by roentgen-ray studies; the latter consisted of both fluoroscopy and roentgenographic stereoscopic films. The average number of refills was 16 per patient. This number of refills per patient indicates a close coöperation of the Bureau beneficiaries with the medical officers, and is one reason why the results obtained in the cases studied were so highly satisfactory. The results following complete collapse were more satisfactory than those following partial collapse. A smaller percentage of cases died following complete than partial collapse. From a statistical standpoint a complete collapse is superior to a partial collapse. However, there are other factors which must be taken into consideration in the discussion of the end-results which may influence the final outcome of the case, as, for instance, the age of the patient, sex, extent of lesions, and the character of the complications. The best results with pneumothorax therapy were obtained in patients with bilateral lesions, who had less than one-third of the better lung involved; the next best results were obtained in patients with unilateral involvement; the poorest results were obtained in patients with bilateral lesions who had more than one-third of the better lung involved. The mortality was highest in those with basal involvement; the next highest death-rate was in the group with bilateral lesions with more than one-third of the better lung involved; the lowest death-rate was among cases with unilateral involvement; and the next lowest death-rate was among those cases with bilateral lesions who had less than one-third of the better lung involved. In a little less than one-half of the patients there was a decrease of the lesions in the noncompressed lung according to physical signs. Some of the patients showed no change in the physical signs of the noncompressed lung. In a small percentage the treatment was accompanied by the extension of the lesions in the noncompressed lung. In 23.64 per cent of the total number of patients, it was necessary to discontinue pneumothorax treatment for various reasons, the principal reason being obliteration of the pneumothorax cavity, another reason being the failure of the patients to improve under this treatment, and finally in 10 of 139 cases because of the death of the patients. A complete collapse has a greater effect on the reduction of temperature than a partial collapse, but, when a partial pneumothorax only is possible, the effect on temperature reduction is quite apparent. Of 588 patients, 522 had tubercle bacilli in the sputum before the institution of pneumothorax therapy, and only 266 showed their presence after treatment. Of all patients under pneumothorax treatment, 52.89 per cent developed complications of various kinds, the most frequent of which was pleural effusion; some reaction after refills was another one frequently encountered. Some of the other complications were cardiac or circulatory embarrassment, subcutaneous emphysema, and pleural shock. Pleural effusion proved to be not of serious import as long as it remained serous.—*Artificial Pneumothorax in the United States Veterans Bureau, P. B. Matz, Am. J. M. Sc., July, 1928, clxxvi, 87.*—(*W. I. W.*)

Late Results of Artificial Pneumothorax.—Pissavy reports from his own statistics on the results from pneumothorax therapy, that at the end of three years 42 per cent of the patients are dead and at the end of four years about 50 per cent. Fewer complications occur if the pneumothorax is instituted earlier. Bernard's personal statistics are similar to those of Pissavy, but he prefers to divide his patients into two groups, those with advanced lesions and those with active early lesions. Of the latter group he reports 55 per cent cured, and of the two groups analyzed together complete cure was obtained in 24 per cent. Rist's figures resemble those mentioned. After six years 38 per cent of the treated cases had succumbed, and of the untreated patients 90 per cent were dead. Better results were obtained in men than in women.—*Résultats éloignés du pneumothorax artificiel, Pissavy, Bernard and Rist, Soc. Méd. d. Hôp., November 18, 1927, reported in Prog. Méd., November 26, 1927, no. 48, 1880.*—(*U. E. Z.*)

Late Results of Artificial Pneumothorax.—Patients treated with pneumothorax have a more favorable prognosis as concerns mortality, duration of life, and working ability than those with like indications in which the procedure was not used. In 76 cases pneumothorax was not instituted and the mortality was 75 per cent with ability to work in 12 per cent, while in the Sanatorium Vogelsang there were 138 treated with pneumothorax with a mortality of 51 per cent and working ability 34 per cent. The observations cover the period of 1912 to

1925. In cases in which pneumothorax was not attempted the duration of life was, on an average, 18 months, while in those in which pneumothorax did not succeed, although attempted, it was 13.5 months. The main factors necessitating the discontinuance of pneumothorax are progression on the opposite side and lack of pleural space following exudates. It is concluded that the permanent results do not correspond to the initial results but are contingent upon the constitution of the patient.—*Dauererfolge bei Pneumothorax und konservativer Therapie der Lungentuberkulose. Ein Vergleich, Anna Raykowski, Beitr. z. Klin. d. Tuberk., 1927, lxvi, 473.*—(*H. J. C.*)

Value of Artificial Pneumothorax.—As a result pneumothorax statistics on over 2000 cases, it is pointed out that pneumothorax treatment, especially as indicated by present-day practice and technique, far excels the results of conservative treatment. —*Zur Frage des therapeutischen Wertes des künstlichen Pneumothorax bei Lungentuberkulose, C. Kruchen, Ztschr. f. Tuberk., 1927, xlix, 108.*—(*H. J. C.*)

Artificial Pneumothorax Treatment at High Altitudes.—Pneumothorax was performed on 149 cases of pulmonary tuberculosis and 1 of lung abscess, 91 being men and 59 women. In 83 of the cases the pneumothorax was left-sided and in 67 right-sided. In the great majority there was a severe exudative cavernous process with unfavorable prognosis, and in all cases tubercle bacilli were present in the sputum. The results recorded were over a period of 2 to 18 years' observation. There were 99 healed (66 per cent), and 9 still ill (6 per cent); while 32 (21.3 per cent) died of tuberculosis, 22 in from 1 to 3 years, 7 in from 3 to 10 years, and 3 in from 10 to 18 years. Eight (5.3 per cent) died from other causes, and 2 were lost track of. If the cases of unsatisfactory collapse were excluded the results were as follows: 81 per cent healed, 3.5 per cent still ill, and 10.3 per cent dead. Of the 150 patients 68, or 45.3 per cent, developed large pleural exudates and, of these, 57 were serous and 11 with mixed infection. In 11 cases there was an existing exudate and the pneumothorax was performed after its removal. In 5 cases pneumothorax was done as a haemostatic. In 21 cases there were complications in other organs. Laryngeal affections were favorably influenced by the pneumothorax, while all except one that died had intestinal tuberculosis. In 1 case, during refill at high pressure, there developed a fatal gas embolism. In 3 cases there occurred the rupture of a cavity into the pneumothorax space, in 1 case following thoracoscopy and cauterization. In 4 of the 150 cases there developed spontaneous pneumothorax which was further treated by nitrogen injections: 3 of these healed, while in the fourth thoracoplasty was performed, and the patient died after the operation. The indications for pneumothorax are markedly extended in the case of bilateral processes at high altitudes. The best results are obtainable by the combined pneumothorax and sanatorium treatment, and especially when the favorable climatic factors of high altitudes are added.—*Dauererfolge der Pneumothoraxbehandlung im Hochgebirge. Statistischer Überblick über 150 während 18 Jahren im Sanatorium Schatzalp behandelte Pneumothoraxfälle, E. C. Neumann and J. E. Wolf, Beitr. z. Klin. d. Tuberk., 1927, lxvi, 688.*—(*H. J. C.*)

Simultaneous Bilateral Pneumothorax.—It is possible to have practically complete collapse of both lungs without the onset of dyspnoea or cyanosis. It is striking to observe the apparent incongruity between the patient's condition of respiratory and cardiac comfort and the radiographic appearance of practically complete collapse of both lungs. The condition is comparable with the state of affairs present in the lungs of the newly born child; that is, there is no reserve air, and the child exists on the residual air in the alveoli. A case is reported of bilateral artificial pneumothorax. The patient showed considerable improvement under this form of treatment. It was also of interest because it afforded an opportunity of studying in the same patient the physical signs of two pneumothorax cavities, in one of which (the right) were adhesions and a pleural effusion, and in the other (the left) a free pleura and no effusion. The percussion note was uniformly hyperresonant over the whole of both lungs except over the base of the right lung below the fluid-level. Breath-sounds were absent over the whole of the right lung, but over the left lung they could be heard invariably, even when a considerable degree of collapse of the lung existed. This would seem to show that the absence of breath-sounds is not a constant concomitant of pneumothorax. It is a common experience to see cases of spontaneous pneumothorax in which the character of the breath-sounds varies little, if any, from the normal. *Coin- or Bell-Sound:* This developed on the right side after the absorption of the pleural effusion, becoming more marked as the pleural membrane became more eclerosed. On the left side, on numerous sxaminations the coin-sound was never elicited. This led to a closer investigation

of the incidence of the coin-sound in other cases of artificial and spontaneous pneumothorax. As a result the following conclusions were deduced: *1:* The coin-sound is elicited in its most marked and characteristic form when the pleura has been thickened or sclerosed by the onset and subsequent absorption of a pleural effusion, either serous or purulent. *2:* The main condition necessary for the production of the coin-sound is not the presence of fluid, but the hardening and increased elasticity of the pleural membrane so that it resembles a sounding board, producing forced vibrations. *3:* The same explanation holds for the production of the coin-sound over cavities in the lung, namely, that there must be an air-space enclosed by thick resistant walls to amplify the vibrations of the metal. *4:* The coin-sound is rarely heard over a pneumothorax cavity when a pleural effusion has not occurred. *5:* The intensity of the coin sound can be increased a little by raising the pressure in a pneumothorax cavity from a negative to a positive pressure, but the tension is not the primary factor.—*Simultaneous Bilateral Artificial Pneumothorax, A. I. G. McLaughlin and G. Fildes, Lancet, October 1, 1927, ccxiii, 698.*—(*B. T. McM.*)

Simultaneous Bilateral Pneumothorax in Children.—In two children, aged 3 and 9 years, apparently beyond hope of recovery, a partial, bilateral artificial pneumothorax was induced. After three months, the patients were not only living, but had gained in weight. The first patient gained from 11 to 19 kgm. and the second from 31 to 47 kgm. Fever, cough, and bacilliferous expectoration disappeared. The same method of treatment was used in other patients and, although the results do not compare with those obtained in unilateral cases, many showed distinct improvement.—*Le pneumothorax thérapeutique bilatéral et simultané chez l'enfant tuberculeux, Armand-Delille and Lestocquoy, Meeting Soc. Méd. d. Hôp., December 6, 1927, reported in Prog. Méd., January 7, 1928, no. 1, 27.*—(*U. E. Z.*)

Bilateral Artificial Pneumothorax.—A case of severe cavernous, predominantly fibrotic, left-sided tuberculosis, and right-sided upper-lobe disease, was treated with pneumothorax on the left side in August, 1924, and on the right side in November, 1924. In 1925 the right-sided disease was arrested, and a left thoracoplasty instituted. Marked improvement and restoration to work for the past two and one-half years has resulted. Another case with bilateral cavernous, predominantly fibrotic, phthisis was treated with pneumothorax on the right side in February, 1925, and on the left side in April, 1925, with immediate improvement, which persisted for a year after the institution of pneumothorax.—*Pneumothorax bilateralis. II. Mitt., J. W. Samson, Ztschr. f. Tuberk., 1927, xlvii, 273.*—(*H. J. C.*)

Perforations in Bilateral Therapeutic Pneumothorax.—Both simultaneous and alternating pneumothorax are now performed not uncommonly. Perforation is the major complication of this procedure. Does it occur more frequently in the case of bilateral pneumothorax? To be sure, one must establish a criterion of its existence. Two such signs have been described by Bernard: *1:* A relative increase in intrapleural pressure over the terminal figures of the preceding insufflation. *2:* A greater degree of collapse as shown by roentgenographs. Acute perforations were observed in 9 out of 34 bilateral cases, or over one-quarter, a far higher proportion than has been determined in unilateral pneumothorax. A case of so called "silent perforation" in a young woman of 19 is recorded. The risks of a pulmonary tear also are much greater than in unilateral pneumothorax. *Causes:* These may be summed up as two, (1) the state of the lung, and (2) the traumatizing agent. If adhesions are torn from an ulcerated area a perforation results. Traumatizing agents comprise rupture of adhesions and puncture of the lung by the needle. Rupture of any adhesion will occur at the point of least resistance. Diagrams are pictured showing the direction of tractile forces exerted on adhesions in various locations. Tuberculous lung zones are critical, dangerous places, where rupture is likely to occur with grave consequences. While it is certain that too copious insufflations predispose to rupture by distention, it is likewise true that too close approximation of lung and pleura by too small doses subjects the former to the danger of puncture by the needle and possibly to the perforation of a cavity. For the average woman's chest a refill of 500 cc. does not seem to cause distress. *Summary 1:* Perforations are more frequent in double pneumothorax than in the classical unilateral procedure. *2:* To prevent or minimize their occurrence one must seek to obtain an initial effective collapse, so as to put the lung in a position where it cannot be readily traumatized.—*Quelle interprétation donner aux perforations survenant au cours des deuxièmes collapsothérapies, qu'il s'agisse de pneumothorax simultanément on successivement bilatéraux? J. Chaubaud, Section d'études scientifiques de l'Oeuvre de la Tuberculose, June 11, 1927, reported in Rev. d. l. Tuberc., August, 1927, viii, 583.*—(*A. P.*)

Selective Collapse in Artificial Pneumothorax.—Selective pneumothorax is another designation for the well-known Gwerder method or partial pneumothorax of Morgan. Barlow's selective collapse exerts a different pressure on the diseased as compared to the healthy lung tissue. Independent of Gwerder, Morgan and Barlow found that the tuberculous portions of the lung tend more to collapse, and on inspiration expand less than the normal portions. In elaboration of this work the author sought to determine the following points: (1) the existence of a selective pneumothorax, (2) the rôle of the selectively collapsed lung in respiratory excursions, and (3) the therapeutic significance of selective pneumothorax. In the absence of respiration, the healthy portions of the lung, after the institution of artificial pneumothorax, were found to be more collapsed than the diseased parts. The following factors are essential for the existence of selective pneumothorax: (1) the relative abolition of the dynamic factors of respiration in the collapsed lung; (2) the localization of the disease to one pulmonary lobe or part thereof, and (3) the pathologico-anatomical form of the disease, in that the initial stages of exudative tuberculosis are most favorable and the presence of marked connective-tissue growth is unfavorable. The ideal selective pneumothorax possesses all the advantages of a complete pneumothorax, that is, a complete collapse of the diseased portion without its disadvantages, such as circulatory disturbances, mediastinal deviation and the danger of large exudates. A spread of the disease to the incompletely collapsed healthy parts was not observed during two years.—*Das Phänomen des Selektiv-Kollapses im künstlichen Pneumothorax. Der ideale Selektiv-Pneumothorax, N. Oekonomopoulo and B. Papanikolau, Ztschr. f. Tuberk., 1927, xlvii, 280.*—(*H. J. C.*)

Artificial Pneumothorax and Bacillary Elimination.—Phthisiologists at present are in accord on the great value of Forlanini's method. Properly applied, it brings about, in many cases, generally excellent immediate results, providing the pulmonary collapse is complete or satisfactory. One of the most rapid and striking of these results is the diminution and final suppression of cough and expectoration; simultaneously the tubercle bacilli diminish and finally disappear entirely. What happens to the bacilli? Are they destroyed? Do they remain in the collapsed lung until definite cure occurs, or are they eliminated by some other than the respiratory route? The existence of tubercle bacilli in the faeces of patients with pulmonary tuberculosis who do not cough, or spit only mucus and saliva, has been demonstrated, in the absence of gastrointestinal lesions. In fact, confirmation of a provisional clinical diagnosis can often be thus obtained. At the onset of the malady there is commonly only a slight cough, often dry, or sometimes followed by a few drops of glairy mucus. This is especially the case in women and children, in whom response to the cough reflex seems deficient. Complement-fixation tests are of little help in such cases, as Calmette has shown; likewise the albumin reaction. Guinea-pig inoculation of the sputum is rarely positive. It is emphasized that we are dealing here with patients who actually do not spit, and not with those who swallow their sputum. In numerous cases of this kind search for tubercle bacilli in the stools is of great service. *Possible Sources of Error: 1:* May one find acid-fast bacilli in the faeces of healthy or nontuberculous individuals? *2:* Are they constantly found in those of the tuberculous? Answering both questions, VanBeneden has never seen acid-fast bacilli in the stools of individuals clinically free from pulmonary tuberculosis and has never failed to find them in sputum-positive patients. This fear of confusion with other acid-fast bacilli, such as smegma, milk and butter bacilli, is not well founded and is responsible for the neglect to search the stools. A precise and careful technique is necessary, and patience. *Technique:* Calmette's method consists in mixing in an Erlenmeyer flask about 30 gm. of faecal matter and 55 cc. of sterile water and 15 cc. of antiformin, then agitating, letting stand at least two hours and centrifugating. On decantation a clot is obtained which is either smeared on slides, stained and examined, or mixed with physiological salt solution, and, after filtering through sterile gauze, inoculated into guinea-pigs. Venot and Moreau's method, which is preferred, is as follows: About 50 gm. of faecal matter is mixed with sufficient 25 per cent sodium chloride to liquefy it, and filtered through gauze into sterile centrifuge-tubes filled two-thirds full. Each tube then receives 2 cc. of a mixture of sulphuric ether and ligroin, equal parts. They are agitated and centrifugated ten minutes at 5000 revolutions. The bacilli collect at the point of separation of the liquids as a thin brownish cake under the upper layer. This is either smeared on slides or inoculated. One must not forget the elementary precaution of making the patient urinate before going to stool, and of having all the material used sterile; also of enquiring whether the patient has any ulcers or fistulas. *Results of Examination in 20 Pneumothorax*

Patients: Eleven of these were women, under treatment at the Eupen Sanatorium. Their sputum had always been positive but at the time of examination they had none. Four had left the sanatorium, but continued treatment and 2 had stopped pneumothorax but were under observation. Nine patients were men, of whom 2 occasionally expectorated a little mucoid material, negative on examination. Of these 20 patients, 18 showed tubercle bacilli in the stools. The examination was made at the Institute of Bacteriology of the University of Liége. Further studies are being pursued.—*Pneumothorax artificiel et élimination bacillaire, A. and J. Van Beneden, Rev. Belge d. l. Tuberc., March-May, 1926, xvii, 69.*—(*A. P.*)

Parodi's Ergomanometer.—In previous publications Parodi has shown the necessity of measuring pneumothorax pressures by other means than heretofore used. He mentions the impossibility of total suppression of movement in the collapsed lung, a finding recently confirmed by Giraud. The quantity of gas penetrating the pleural cavity acts as a sort of elastic cushion limiting pulmonary and thoracic movements. As a guide in pneumothorax, it is important to know the dynamic value of each phase of respiratory movement, and the ergometer registers this. There are two kinds of manometers: (1) manometers of unstable equilibrium and (2) those of stable equilibrium. The ordinary U-manometer is an example of the first. Such ought only to be used to measure static pressures responding to Boyle's and Mariotte's laws. Parodi's ergomanometer functions according to the following principles: In inspiration the liquid column is directly aspirated; in expiration it is elevated by compression. A double enclosed system permits the measurement of mobile conditions during the respiratory phases: for instance, (1) value of the elasticity of the respiratory system during expiration, (2) dynamic value of inspiratory oscillations, and (3) the aspiratory force and the inspiratory depression of the thoracic cavity relative to external pressure. The apparatus is minutely described and illustrated in diagram. The stopcock connecting with the intrapleural air has two openings exactly corresponding to the diameter of the needles used. Mathematical formulae are given to determine various factors. It is true that the employment of this apparatus demands minute and perhaps prolonged observation, but that is to be desired in the practice of pneumothorax.—*Ergomètre pulmonaire, appareil destiné à mesurer la pression dans le pneumothorax artificiel, basé sur les principes dynamiques du travail, F. Parodi, Rev. d. l. Tuberc., June, 1927, viii, 371.*—(*A. P.*)

Parodi's Ergomanometer.—Parodi differentiates the endopleural pressures into the pressure at rest and the pressure of movement. The pressure at rest represents the physiological endopleural depression which is independent of the movements of the thoracic organs. This is called the "static pressure." The pressure of movement is the resultant of the movements of the thoracic organs (thoracic wall, lungs, mediastinum and diaphragm) and expresses the amount of work done by them. This is called the "dynamic pressure." The static pressure is to the dynamic pressure as one is to three. The static pressure is inversely proportional to the dynamic pressure. Static pressure is always negative, and the dynamic pressure is always positive. The static pressure is due to the elasticity and contraction of the lung at rest. When infiltrative or destructive lesions are present in the lung parenchyma a retraction and diminution in the size of the lung occurs, which markedly alters the pressure at rest. When an increase in the static pressure is observed, a parenchymatous lesion is usually present. The higher the pressure, the more extensive is the lesion. In emphysema this pressure is lowered and sometimes disappears entirely. An ergomanometer is described which measures the endopleural pressure and the amount of work done by the respiratory organs. The instrument communicates with the pleural cavity and the insufflating apparatus, replacing the ordinarily used manometer. The following measurements may be made with the apparatus: *1:* Amplitude of the thoracic, pulmonary and diaphragmatic movements. *2:* Elasticity of the lung. *3:* Dynamics of the parietes and mediastinum. *4:* Expiratory compression. Readings may be taken before, during, or after insufflation. By means of the ergomanometer the optimum pressures necessary for an effective collapse are more accurately determined. It indicates the functional condition of the compressed lung, the mobility of the mediastinum and the existence and localization of pleural adhesions.—*Valore dell'ergomanometro polmonare "Parodi" per lo studio clinico e manometrico del pneumotorace, M. Mazetti, Tubercolosi, October, 1927, xix 375.*—(*U. E. Z.*)

Roentgenoscopy during Institution of Artificial Pneumothorax.—These studies were instituted to clarify a number of the questions still existing regarding the origin

and development of an artificial pneumothorax during the injection of the gas. In both cases the dorsal-ventral illumination of the pneumothorax revealed its existence first in the paramediastinal, then over the diaphragm and at last lateralward. These findings are explicable on the basis of the anatomical relations of the chest and the direction of the rays, projection, etc.—*Pneumothoraxstudien. I. Untersuchungen am Röntgenschirm während des Anlegens von künstlichem Pneumothorax, E. Schill, Beitr. z. Klin. d. Tuberk., 1927, lxv, 486.—(H. J. C.)*

X-Ray Observations of Artificial Pneumothorax.—The direct determination of the freedom of the pleural space by means of the movement of formations, such as calcifications, strands and cavities, is rarely attainable. Limitation of the movement of the diaphragm can be occasioned by nervous and muscular causes, without the presence of adhesions, and adhesions can be present under normal conditions. Rhythmic cardiac movements of the diaphragm permit the conclusion that there is a loss of elasticity of the intervening lung, and therefore the possibility of adhesions. Unilateral contraction need not mean that there is no free pleural space.—*Was leistet die Röntgendiagnostik zur technischen Prognose des Pneumothorax? F. Fleischner, Beitr. z. Klin. d. Tuberk., 1927, lxvii, 582.—(H. J. C.)*

X-Ray in Pneumothorax.—The value of the roentgen ray in study and diagnosis of diseases of the chest is increasing rapidly, and in proportion to the widespread use of standard technical methods and a common language. The roentgenological plate should be more widely used in tuberculosis to indicate the proper time for the induction of artificial pneumothorax. This would lead to a much higher incidence of complete collapse because collapse could be begun before the formation of extensive adhesions; this is especially true in the acute types of tuberculosis. Pneumothorax is no longer reserved for a "last resort" measure. If this type of therapy be applied to acute, caseating, progressive tuberculosis as soon as the nature and extent of the condition is revealed by X-ray, the clinical results would be far better than they are to-day. In this way the roentgenologist would be of great assistance to the clinician in aiding him to arrive at a decision.—*Editorial: The X-Ray and Pneumothorax, W. R. Abbott, Radiology, April, 1928, x, 247.—(H. S. W.)*

Electrocardiographic Changes in Artificial Pneumothorax.—The electrocardiograph can be used for the diagnosis of pleuropericardial adhesions without marked involvement of the mediastinum, and when the heart is drawn from its position by respiratory excursions. A change occurs in the size of the R wave. The electrocardiograph, during and after pneumothorax filling, reveals an acceleration stimulation, even with positive pressure. The changes comprise an increase of the P wave and a mild tachycardia, which is not psychical. Finally, there can also be extrasystoles and a diminution in the T wave.—*Das Elektrokardiogram bei intrathorakaler mechanischer Beeinflussung des Herzens, insbesondere während und nach Anlage oder Nachfüllung des künstlichen Pneumothorax, Rehberg, Beitr. z. Klin. d. Tuberk., 1927, lxvii, 725.—(H. J. C.)*

Ballottement of Lung in Artificial Pneumothorax.—In four patients receiving artificial pneumothorax, with absence of adhesions, movements of the collapsed lung were noted. A sudden change from the horizontal to the vertical posture caused a flapping of the lung-stump which could easily be perceived by the palpating hand. This sign is not intended as a true indicator of the presence of a pneumothorax. The phenomenon is apparently independent of intrapleural pressure and disappears when fluid is present.—*Le ballottement pulmonaire au cours des pneumothorax artificiels, Rist and Hirschberg, Meeting, Soc. Méd. d. Hôp., February 3, 1928, reported in Prog. Méd., February 11, 1928, no. 6, 243.—(U. E. Z.)*

Pathogenesis of Artificial Pneumothorax Accidents.—The practice of therapeutic pneumothorax has drawn attention to a series of nervous accidents well known and frequently designated as "pleural reflex, epilepsy or eclampsia." These are of extreme gravity, often fatal, and cause the operator to have a feeling of insecurity. Happily, they are rare. Bezançon has recently reported ten observations. Croizier, in a series of cases comprising some 10,000 punctures, has never had an incident of this sort. He does, however, venture an opinion as to the mechanism involved, which is quite at variance with those commonly expressed, at least in the French literature. In a large number of cases, when the facts are precisely recorded, the conditions at the time of puncture have not justified the assertion that the needle was in a free pleural space: either there was no oscillation on the manometer, or the oscillations were in the neighborhood of zero. In nearly all the cases insufflation has been under pressure, and the symptoms have come on suddenly,

often while the needle was still in position, the patients going into syncope or convulsions, often Jacksonian in type, remaining limited to one side. These are succeeded by tonic contractions, and facial paralysis and conjugate deviation of the eyes are common. Sometimes there are visual disturbances or amaurosis. In about half the cases death occurs within a few moments, in others within several hours. The only plausible theories advanced are gas embolism and pleural reflex and one must choose between them. *Consideration of Reflex Hypothesis:* A reflex is a physiological act provoked by peripheral excitation, transmitted centripetally and reflected into motor-nerve channels. There can hardly be such a thing as reflex death, but only death by inhibition, if due to excessive peripheral stimulation. Such a death occurs following the well known puncture of the bulb. If puncture of the pleura has a similar effect, the intermediation of the vagus must be invoked. Also, why is death, if this be the mechanism, not instantaneous, as in puncture of the bulb, but attended by convulsions, hemiplegia, etc., clear manifestations of cerebral irritation? Again, in the case of puncture of the bulb, the response, arrest of the heart, is constant. Why, in the case of puncture of the pleura, can this be done 12,000 times without any abnormal response? If these reflexes are conditioned, as suggested, by a particular nervous state, why are they so seldom observed on the first puncture, and why do they occur in patients who have previously been punctured with no reaction? On the other hand, they may occur in the most stolid subjects, and may never happen to the most apprehensive and impressionable. It seems clear that neither vagotonia, nor emotivity, of the subject, nor any other of these factors plays any real rôle. Clinically, the theory of pleural reflex falls down on every hand. Animal experiments, particularly those of Cordier, have long been considered the principal demonstrable basis of the reflex theory. It is known that he selected rabbits because of their slight sensitiveness to pain and facility with which convulsions could be produced. He used tincture of iodine, with which by intrapleural injection he produced epileptiform convulsions and death. Local anaesthesia diminished the frequency of this response and section of the vagus prevented it. Although the injection of tincture of iodine is a trauma of very different nature from simple puncture, Croizier repeated Cordier's work and was absolutely unable to confirm his conclusions. Intrapleural injection of tincture of iodine causes neither epileptiform convulsions nor sudden death. The discrepancy is deemed to be due to the matter of technique. Cordier did not describe his methods in detail, and it is probable that he did not employ manometric control of the intrapleural injections. On the other hand, Croizier used Küss's trocar attached to a manometer. Only when a satisfactory oscillation and negative readings were obtained was a syringe containing 2 cc. of tincture of iodine attached, the piston being removed so that no pressure was exerted and the iodine was merely aspirated. No convulsive crisis or sudden death occurred. However, the animal was severely shocked and breathed with difficulty. A pathological and bloody effusion soon appeared, and if the animal was not killed it died eventually with more and more marked dyspnœa and considerable effusion. The lung was always congested and stained, and showed superficial necrosis. The phenomena were those of an intense serous inflammation, often extending into the lung, but there were no pleural reflexes such as described. On the other hand, an intrapulmonary injection determines exactly the convulsions and crises observed by Cordier, with death occurring within a few minutes. It is very easy to puncture the lung without leaving evidence of it to ordinary examination. Examination under water, to be sure, with insufflation, will reveal a sort of indurated area and on pressure a little oedematous fluid will be forced out. Cordier seems to have ignored the possibility of intravascular penetration of the injected fluid. That the nervous centres are very sensitive to minute amounts of tincture of iodine is readily demonstrable. When the iodine is injected directly into the carotid its presence in the cortical vessels is readily demonstrable, but when injected into the lung the resulting cerebral embolism is too minute and chemical methods must be used. These, carefully carried out, have never failed to be positive when convulsive crises and sudden death followed the injection. A further corroboration of the vascular hypothesis is furnished by Cordier himself, who found that ligation of the carotids arrests the manifestations observed. Negative results following some of his intrapleural injections are merely fortuitous, due either to actual intrapleural injection or to puncture of the lung without resultant embolus. Croizier has also felt it worth while to repeat Cordier's experiments on sectioning the pneumogastric nerve. It was easy to show that this procedure had no effect whatever on the results of intrapulmonary injection. From the above, one thing seems sure: that there never were "pleural reflexes," and the whole theory, already

clinically refuted, falls to the ground from an experimental standpoint and must be abandoned. *Mechanism of Gas Embolism:* In the first place, there is no analogy with ordinary emboli due to the entrance of air (or other matter) into the main venous circulation, since these emboli are pulmonary, *via* the right heart. On the other hand, air entering the pulmonary veins passes to the left heart, thence to the aorta, and risks entering the carotid. In such a delicate organ as the brain, the slightest trouble with its circulation provokes immediate and grave accidents. The difference in clinical features between obliteration by a clot and obstruction by a gas embolus can readily be realized. The former can not penetrate the finer cerebral ramifications as can the air bubbles. It has also been noted that emboli accompanied by visual disturbance are less often fatal. These latter are due to entrance of the air into the ophthalmic artery and retinal vessels, which derive from the external carotid. A final objection is that following these accidents emboli cannot be demonstrated anatomically by most careful methods. The truth is that they are invisible, even when produced experimentally, unless the air is put directly into the carotid. It is fortunate that only a small proportion of lung punctures result in emboli, since incorrectly performed insufflations are not uncommon in the practice of pneumothorax. Even the entrance of 1 to 2 cc. in the carotid of a rabbit results in rapid death after a convulsive attack. Even so, it is practically impossible to localize the embolus in the brain. However, when this syndrome occurs there can be no doubt that there was an embolus. The fact of its material possibility admitted, its existence should also be admitted. In many of the recorded necropsies wounds of the lung were found, but it has been demonstrated that they may have occurred and yet not be found. A little manipulation of the lung readily effaces them. The fact that a negative manometer reading was obtained is not conclusive evidence of penetration of the pleura, unless there was oscillation clearly defined. It is possible for a manometric depression to occur just at the moment of reaching the pleura and to persist when the needle is thrust more deeply or the lung expands against it. Unless the stopcock was tightly closed it is impossible to state that no air entered the lung. Freund has estimated that the air contained in the tubing of the apparatus may suffice to cause embolus, but this seems doubtful unless the manometer shows aspiration. Another possibility is entrance of air from a preëxisting pneumothroax cavity along the needle track, or from neighboring air-passages. This possibility is based on the negative pressure existing in the pulmonary veins. Another point is that all these accidents present the same general features, so that it is unlikely *a priori* that in some an embolus, in others a reflex, would be the cause. *Emboli from Other Intrathoracic Manipulations:* Among the data gathered by Cordier, 39 cases (nearly half) were due to pleural lavage. It is not astonishing that the mechanical action of rather brutal irrigations should traumatize the walls of the pleural cavity and break adhesions. Certain of the solutions used, especially alcohol, iodine and phenol, would be especially likely to penetrate blood vessels. Similar crises may result from changing a drain, there being a small erosion of the visceral serosa. Some of the accidents described also resulted from exploratory puncture, which, of course, wounded the lung, and it is easy to understand how an embolus could ensue, especially when the needle on withdrawal showed blood, as in a number of cases. *Precautions:* Accepting the pleural-reflex hypothesis, we are impotent to prevent these accidents; but if we know them to be caused by emboli we can be on our guard. Prudence in manoeuvering with the type of case known to be dangerous is to be recommended. Croizier attributes his lack of accidents to the fact that he is haunted by the idea of embolus, and that the thought never leaves him that he may kill his patient. When groups of patients are treated at a séance one must always consult the clinical record to determine the site of puncture, the initial pressure, and the roentgenographic morphology. Free and permanent manometric oscillations must be obtained. It is dangerous to pass a stilette to clear the needle. This has cost more than one life. Wounding of the lung must often occur, and in a large number of cases is without danger. It provokes nervous accidents only when it opens a pulmonary vein, and probably then only under special conditions. But it must not be risked. When in doubt withdraw the needle and make a fresh puncture. Cases with many adhesions are particularly dangerous. To puncture them may be as dangerous, if not more so, as to puncture the lung. Too copious insufflations and too high pressures should be avoided. While positive pressures must be used in certain cases, they should be resorted to only exceptionally. Very high pressures are not justified by the benefits accomplished. Protocols of 17 experiments on rabbits are cited.—*Sur la pathogénie des accidents du pneumothorax, L. Croizier, Rev. d. l. Tuberc., August, 1927, viii, 477.*—(*A. P.*)

Nervous Accidents in Artificial Pneumothorax.—In the *Revue de la Tuberculose* for August, 1925, Bezançon, Azoulay and Chabaud published a discussion of the pathogenesis of these accidents, and in the *Journal de Médicine de Bordeaux et du Sud-Ouest* for February 25, 1926, Leuret and Caussimon devoted an article to the same subject entitled *Spasmodic Muscular Syndrome in the Course of Artificial Pneumothorax.* The former article comprises only 10 detailed cases from French literature and 8 from foreign, added in an after-note. Leuret and Caussimon add 4 new observations to 5 already published by themselves and Fontan and not included in Bezançon's list. Vandriessche adds 3 personally observed cases, as follows: *1:* A young man of 26 had left-sided artificial pneumothorax induced by Hervé at Lamotte-Beuvron Sanatorium, receiving refills at two-week intervals. Auscultation, when he came under observation, revealed adventitious sounds over a large extent on the side of the supposedly collapsed lung. Fluoroscopy showed a very incompletely collapsed lung, but a clear zone was seen extending toward the base and its surface boundaries marked. Some tympany was obtained, and this site was chosen for puncture. A click was heard as the needle went through, but the manometer registered no oscillations. On a second puncture, more internally, oscillations of −8 to −2 were obtained. The gas reservoir was connected and about 850 cc. allowed to enter until the manometer reached zero. The patient then mounted the stairs to be fluoroscoped again, sat down a few moments in an easy chair, and was placed behind the screen. After a fleeting glimpse he collapsed, with complete muscular relaxation on the pneumothorax side. He soon regained consciousness, but after about a quarter of an hour, as he was still pale and his pulse rapid, he was given an injection of camphor and caffeine. The same accident had occurred at a previous insufflation, when he was punctured several times. Subsequent punctures were uneventful. *2:* A young woman of 23, with exudative tuberculosis of the right lung and a cavity in the middle lobe, received pneumothorax, later complicated by exudate, which became more or less loculated. Treatment had been uneventful, including oxygen replacement of the fluid. On the occasion referred to the needle was introduced as usual. At the moment of puncture of the pleura the patient uttered a guttural cry, her left side became flaccid, and there were clonic contractions of the side opposite the pneumothorax. The eyes were dilated and fixed and she was absolutely unconscious for a moment. Then she came to and after a time was able to walk home. She complained, however, for twenty-four hours, of intense headache and nausea. There did seem to be more than the usual resistance to the needle in this case and an adhesion was thought to have been wounded, or perhaps thickened interlobar pleura. The presence of exudate obscures what is behind. *3:* A young woman of 25 with a fixed diaphragm had pneumothorax tried, and a free space was found in the anterior axillary line. The manometer registered −4, and 150 cc. of oxygen were introduced to bring it to zero. Next day a small gas pocket was visible under the screen, peeling off the right upper lobe. A subsequent puncture was made in the lateral part of the clavicular fossa and 100 cc. air introduced. This was repeated a half dozen times. Finally, after introduction of 250 cc., a pressure of +12 was left. At this point the patient had pain and sense of pressure and the needle was withdrawn. She got up, dressed, and was ready to leave when she fainted in a chair, rolled her eyes, her face and right leg contracted and she seemed to lose consciousness. She was given hypodermic stimulation and quickl recovered, but the following day her head felt heavy. *Summary:* In case 1 the accident occurred relatively long after a refill, which occurred by simple aspiration. In the second case it followed the introduction of the needle, without entrance of any gas. In the third case it occurred after completion of the operation. Cases 1 and 2 were old pneumothoraces, case 3, recent. Case 1 was an almost complete pneumothorax, cases 2 and 3 incomplete, one with fluid, the other with obliterative pachypleuritis. It is thought that in none of these cases was embolism concerned, but that the phenomena are to be classed among disturbances of the sympathetic nervous system due to a sort of paroxysm of irritation of a lung already chronically irritated. A normal lung and healthy pleura have no sensation, but everyone knows the violent pain in the side from pleuritic pneumonia and spontaneous pneumothorax. The accompanying cardiorespiratory and vasomotor symptoms are of "vegetative" origin. "Brutalization" of the diseased lung, either by repeated punctures or increased pressure, is regarded as the essential factor. Bezançon's cases are analyzed regarding this point, as follows: In case 1 we read "small oscillations, impression of not being in the pleural cavity;" after the needle was reintroduced the patient felt râles in the chest (due to pulmonary haemorrhage), and at autopsy an adhesion was found a few cm. behind the site of puncture. In case 2 the pressure was positive through-

out. In case 3 there had been numerous fruitless attempts prior to the crisis. In case 4 it was tried to renew an old abandoned pneumothorax. In case 5 the puncture was painful and there were no oscillations, and bloody sputum, etc. Analysis of Leuret and Caussimon's newer observations shows: *1:* Negative exploration. *2:* Negative exploration, the second being followed by the crisis, and the patient spitting frothy blood. *4:* Many previous attempts, small gas pocket, etc. "Brutalization" of the lung must have occurred in all. The exact nature of these phenomena is difficult to explain satisfactorily, except by words which mean little. The only conclusion hazarded is that the theory of gas embolism ought to be forever abandoned.—*Les accidents nerveux subits au cours des insufflations du pneumothorax artificiel, A. Vandriessche Rev. Belge d. l. Tuberc., March-May, 1926, xvii, 95.*—(*A. P.*)

Complication in Artificial Pneumothorax.—A case is reported because the introduction of air below the diaphragm is a rare accident in artificial pneumothorax treatment. In giving a patient her refill the needle was placed in the seventh intercostal space in the left axillary line. On entering the pleural cavity, the manometer gave a reading of −5–10 with respiration, and 50 cc. of air were insufflated easily without undue use of endopleural pressure as on previous occasions. More air, therefore was introduced, the pressure rising slowly until after 400 cc. had been introduced. The final pressure was 0 + 3. After sitting up, the patient was seized with acute pain in the upper abdomen on the left side and was unable to stand on account of the agonizing pain, but on lying down again the pain completely disappeared. Roentgenographs were taken, and showed both sides of the diaphragm raised, and the presence of air between the stomach and diaphragm on the left side, and between the liver and diaphragm on the right side. After four days the air was completely absorbed and the patient had no more discomfort in her abdomen.—*A Complication in Artificial Pneumothorax Treatment, M. Gerber, Tubercle, May, 1928, ix, 357.*—(*W. I. W.*)

Tuberculous Haemopneumothorax Complicating Collapse Therapy.—This seems to be of extremely rare occurrence, hence four cases occurring at the Hôpital Laennec and Léon Bourgeois Dispensary in the course of sixteen years are reported. The clinical picture and apparent pathogenesis differed widely but the dominant symptom was always dyspnoea, more marked than in the case of ordinary exudates, and out of proportion to the amount. It is marked from the onset, acutely painful and distressing, giving sometimes the impression of imminent death. In case 2, in which the fluid appeared near the beginning of treatment, and following aspiration of an ordinary serous exudate, it is believed that too sudden expansion of the lung resulted in the tearing of adhesions, and the rupture of newly formed vessels. Quite the contrary was the case in case 3, in which, six years after beginning treatment, and following a considerable physical effort, occurred a haemorrhagic pleurisy, with very severe local and constitutional symptoms. Despite the serious symptoms all these patients recovered from this complication satisfactorily. Its management is often a delicate matter. The idea is not to touch the fluid without a major indication. Insufflations, when possible, may be prudently continued. If dyspnoea is excessive, small evacuations may be made but their effect is likely to be transitory. Even in the presence of a plastic process, unless one can by exploration determine that haemorrhage has ceased, one should not intervene.—*L'Hémo-Pneumothorax Tuberculeux au Cours de la Collapsothérapie, L. Bernard, L. Baron and J. Valtis, Rev. d. l. Tuberc., August, 1927, viii, 465.*—(*A. P.*)

Mediastinal Emphysema Complicating Artificial Pneumothorax.—A case is reported of wide-spread pulmonary tuberculosis on the right side in which an attempt at artificial pneumothorax resulted in the introduction of air into the mediastinum with a subsequent subcutaneous emphysema of the neck which resorbed after 24 hours.—*Pneumothoraxstudien. I V. Mediastinales Emphysem, als Komplikation des künstlichen Pneumothorax, E. Schill, Beitr. z. Klin. d. Tuberk., 1927, lxv, 505.*—(*H. J. C.*)

Artificial Pneumothorax and Laryngeal Tuberculosis.—Two patients with laryngeal tuberculosis, secondary to a pulmonary lesion, were given artificial pneumothorax, and within a few weeks the laryngeal lesions were completely healed. One of the patients had lesions in both lungs and a bilateral pneumothorax was induced. In order to establish definitely the diagnosis of tuberculosis of the larynx, a biopsy was done in the second case before pneumothorax therapy was instituted.—*Pneumothorax artificiel et laryngite tuberculeuse, Ameuille and Tarneaud, Meeting Soc. Méd. d. Hôp., October 14, 1927, reported in Prog. Méd., October 22, 1927, no. 43, 1672.*—(*U. E. Z.*)

Laryngeal Tuberculosis and Artificial Pneumothorax.—Nine cases of laryngeal tuberculosis complicating pulmonary tuberculosis are submitted, with complete healing in six cases; one case still has active disease of the larynx, one patient died, and the remaining patients had a relapse four months after it had apparently healed. Complete healing was obtained in four of the cases following the induction of artificial pneumothorax with satisfactory collapse of the diseased lung and without any local treatment other than vocal rest. In one case the laryngeal disease extended after the induction of artificial pneumothorax, but after three treatments with the galvanocautery over a period of six months there was complete healing. In still another case tuberculosis of the larynx developed after admission to the sanatorium and after induction of artificial pneumothorax. It is emphasized that it is very unusual for this to occur. The condition subsided rapidly under silence, and complete recovery was finally obtained without any other local treatment. Such writers as Riviere, Burrell, Dumarest, Murard and others are quoted as believing that the acute miliary invasion is the only type of tuberculosis of the larynx that contraindicates artificial pneumothorax. The conclusions are as follows: Cases of pulmonary tuberculosis are always rendered much more serious by the addition of a laryngeal extension. This laryngeal complication is of still worse augury if it develops after admission to a sanatorium or after an induction of an artificial pneumothorax. In spite of this experience, the presence of tuberculosis in the larynx is no contraindication to this operation. On the contrary it may speedily effect a cure or render more promising the addition of galvanocautery or other treatment. The larynx can be cured by this measure, even although bacilli may continue to be present in the sputum and mischief to be detectable in the chest. The indications for artificial pneumothorax must, primarily, be based on the pulmonary and general condition of the patient. So far as the larynx is concerned the only contraindication would be an acute, miliary invasion.—*Tuberculosis of the Larynx and Artificial Pneumothorax, St. Clair Thomson and R. R. Trail, Lancet, May 7, 1927, ccxii, 963.*—(*H. McL. R.*)

Artificial Pneumothorax and Pregnancy.—A woman with pulmonary tuberculosis who was treated by artificial pneumothorax became pregnant. The pregnancy was allowed to pursue its normal course, and artificial pneumothorax was continued. The pregnancy had no apparent effect on the treatment, and the treatment no apparent effect on the pregnancy. The confinement proceeded normally and more easily than in the average case. No definite conclusions can be drawn from this one case. It would appear that the induction of abortion is not indicated in a patient suffering from pulmonary tuberculosis who becomes pregnant during artificial pneumothorax treatment, provided the general condition remains satisfactory.—*Artificial Pneumothorax Treatment Complicated by Pregnancy, A. P. Ford, Tubercle, December, 1927, ix, 112.*—(*W. I. W.*)

Heliotherapy in Tuberculosis.—The sun exhibits a larger number of all kinds of rays in the highlands than in low-lying districts. At sea level, the rate of absorption being high, sunshine exhibits proportionately fewer ultraviolet rays under the 313-millimicra wave-length, and many blue, violet and heat rays. All radiant energy under 313 millimicra is immediately absorbed by the outer epidermal layer, while the longer ultraviolets, as well as the violet and blue waves, possess greater penetrative power. If artificial light is to be used, one should choose a source which, like the sun, provides a continuous spectrum, with the greatest number of blue, violet and ultraviolet rays of greatest possible wave-length and also containing luminous heat rays. Among the various sources, only the carbon, iron and tungsten-arc and the mercury-vapor lamps provide any amount of chemically active light, and of these only the carbon-arc gives a continuous spectrum. Clinical results bear out the greater value of the carbon-arc light in therapy over those with line spectra. As carbon-arc lamps vary widely in therapeutic value, the best type is one that can carry an extremely powerful current, with relatively thin electrodes, the intenser white light from the crater of the positive electrode being the richer in chemically active rays. The Siemens A carbon is the best, and direct current must be used, as the alternating current will not form a crater in the positive electrode. It is possible to effect a cure in lupus vulgaris as well as in tuberculosis of the larynx by means of universal light treatment alone. The method of treating laryngeal tuberculosis by universal irradiation, when used in conjunction with local treatment, is to begin at once, in adults with no pulmonary complications, with a twenty-five to thirty minutes' exposure over the whole body with the carbon-arc, and ten minutes' irradiation for small children; with mercury-vapor lamps both adults and children should be irradiated only five minutes. Once the patient is pigmented by the carbon-arc, there

is no danger in beginning with a two-hour exposure even after an interval of a fortnight. After every light-bath the patient is given a tepid shower-bath. No light is given during intercurrent periods of fever, and the increasing dosage is regulated by the patient's general condition and skin reaction. Severe forms of heart disease, arteriosclerosis, and nephritis not of tuberculous origin are all contraindications to light-baths. Treatment by universal carbon-arc irradiations is suitable in all cases of laryngeal tuberculosis, except that slight infiltration in the interarytenoid area usually clears up after local treatment alone. No attention is paid to slight elevations of temperature, but, if there is a rise to 102° or more, treatment is temporarily discontinued, to be resumed at smaller dosage. If the patient cannot become accustomed to the carbon-arc by this method, a temporary irradiation with the mercury-vapor lamp will often result in more stability of temperature when transferred to the carbon-arc. A maximum of two and one-half hours is usually reached on alternate days. Frequently an early loss of weight occurs, but this is soon checked and regained. Haemoptysis is not usually excited by light-baths, and if it occurs a temporary discontinuance alone is necessary. Local treatments of the laryngeal condition, in conjunction with general irradiation, are important, consisting of galvanocaustics or excisions. Light-baths are attempted alone until the general condition is improved, and there is evidence of a fair immunobiological reaction. As a rule, treatment lasts from six to sixteen months, and should continue a month or more after all signs have disappeared. In tuberculosis of the middle ear, general irradiation is supplemented by removal of caries from the temporal bone, and in lupus of the nose, mouth and throat by electrocoagulation and surgical treatment. Universal sun-bath treatment of tuberculosis and laryngeal tuberculosis is employed only to a limited degree, and without noticeably successful results. Reflected sunlight treatment of the larynx is unsuccessful because of the difficulty of irradiating the actual areas affected, and because the mirrors absorb too many of the chemically active rays. Cures have been effected in 86.6 per cent of patients with rhinolaryngological lupus vulgaris at the Finsen institute in Copenhagen by the above methods of general carbon-arc irradiations and local treatments. In laryngeal tuberculosis 203 patients were treated, with cure resulting in 55.6 per cent of cases. Hoarseness in 110 (aphonia in 9) cleared up after treatment, and pain and difficulty in swallowing disappeared in twenty-five.—*Heliotherapy and Artificial Light: Treatment of Tuberculous Conditions and Particularly Laryngeal Tuberculosis, O. Strandberg, J. Am. M. Ass., May 19, 1928, xc, 1595.*—(*G. L. L.*)

Heliotherapy in Pulmonary Tuberculosis.—In view of the present popularity of the therapeutic use of the sun's rays and other forms of light on the part of both the medical profession and the laity, it behooves us to become conversant with the limitations and dangers inherent in the procedure. The general impression seems to be that it is quite harmless, and if it does no good it will at least do no harm. This is by no means the case in pulmonary tuberculosis. The action of sunlight here is comparable to the action of tuberculin in that it produces congestion at the site of the disease. This congestion is proportional to the intensity and duration of the exposure, and may be so severe as to partake of the nature of pneumonia and be followed by dissemination of the tuberculous process. It is not necessary to expose the chest directly to get ill effects. Exposure of other parts of the body or extremities may be followed by unfavorable or disastrous reactions. Exposure of the skin to the air alone is responsible for much of the benefit derived from sun-baths. Directions for giving air- and sun-baths without danger to the patient are outlined. Unfavorable reactions must be continuously watched for. These unfavorable symptoms are those of overstimulation, either constitutional or focal. Constitutional symptoms include increased temperature persisting longer than half an hour after the bath (there is always a transient increase in temperature), a feeling of fatigue or weakness, dizziness, nausea, headache, increased pulse rate, anorexia, or nervous irritability. Focal symptoms include increased expectoration or cough, pleurisy, blood spitting, or a feeling of tightness across the chest. *Any patient who feels worse after a bath than before has had too much sun.* Many patients can never take sun-baths without ill effects. Ultraviolet light is to be used when sunlight is not available. It is not harmless and the dosage must be carefully graduated.—*Heliotherapy in Pulmonary Tuberculosis—Its Possibilities and Dangers, C. R. Howson, California & Western Med., 1928, xxix, 25.*

Artificial Heliotherapy.—The Van den Nest Dispensary at Antwerp instituted this work in May, 1924. At first there were two voltaic arc-lamps; later three new ones, and in April, 1925, two mercury-arc lamps, Gallois type, were added. A year's experience leads to the opinion that in the treat-

ment of rickets and infantile debility both types of lamp are of equal value; likewise, in cutaneous, lymphatic, and osseoarticular tuberculosis in children under five years. In older children and adults voltaic arc-lamps are to be preferred. From May, 1924, to December, 1925, inclusive, 243 patients were treated, of whom 171 terminated it by the end of the above period. Of these, 59 abandoned treatment prematurely because of lack of perseverance. *Results:* In *rickets* the results were entirely satisfactory. Every case ought to receive phototherapy as soon as the diagnosis is made. A double series of 12 to 15 baths, separated by a month interval, will practically always cure, and in early cases a single series. Treatment of debilitated children has likewise been quite satisfactory. It is used as a preliminary to the marine cure. There were 18 such cases. Tuberculous adenitis has been generally benefited, especially suppurating and fistulous forms. Closed suppurative lymph nodes should be aspirated aseptically, and fistulous lymph nodes regularly expressed or lightly curetted if the course of healing is delayed. Periadenitic infiltrations seem to be benefited. Phototherapy, however, does not seem to arrest the evolution of early suppuration and such patients do not respond as well generally. Cold abscesses respond well. There were 42 cases of tuberculous osteitis and osteoarthritis, of whom 26 are still under treatment, 15 less than six months; one died of meningitis, 7 were abandoned prematurely, and 8 are cured, including 2 of spina ventosa, one fistulous osteitis of the tibia, one fistulous costal osteitis, 2 fistulous white tumors of the knee, and 2 cases of tuberculosis of the spine. Tuberculous peritonitis, especially ascitic forms were successfully treated by general voltaic-arc light-baths. The other forms are more resistant. Ocular tuberculosis is refractory. In pulmonary tuberculosis ambulatory treatment by light baths is not advised.—*Coup d'oeil jeté sur les résultats obtenus dans le service d'héliothérapie artificielle du dispensaire Van den Nest, à Anvers, P. François, Rev. Belge d. l. Tuberc., March-May, 1926, xvii, 153.*—(*A. P.*)

X-Ray Treatment of Pulmonary Tuberculosis.—The results are reported on 353 cases. All exudative cases were excluded as unsuitable. The dosage was gradually increased from 6 to 9 to 12 per cent of the erythema dose. In women 6 per cent was not exceeded. Treatment for three months led to results that in 14 per cent of the cases definite contractions were determinable, which is attributed to the X-rays. Of those treated there were 69.9 per cent fully able to work after one to six years.—*Über Dauerfolge nach Röntgenbestrahlung bei Lungentuberkulose, K. v. Holten, Ztschr. f. Tuberk., 1927, xlvii, 1.*—(*H. J. C.*)

Problems in Heliotherapy.—A measuring apparatus for ultraviolet rays between 3200 and 2400 Angstroms with a maximum sensitivity at about 2800 Angstroms is described. It consists of a cadmium photoelectric cell in a uvial glass bulb connected to an amplification device in order to permit the use of an ordinary switchboard galvanometer. The scale of the recording instrument can be calibrated in ultraviolet units or medium erythema dose of normal adult human skin.—*Physical and Biological Problems in Heliotherapy, E. A. Pohle and W. S. Huxford, Am. J. Roentgenol. & Rad. Ther., February, 1928, xix, 144.*—(*W. I. W.*)

Phototherapy at Finsen Institute.—As a substitute for the sun Finsen chose the electric carbon-arc light, which, like the sun, has a continuous spectrum and long-waved ultraviolet rays. Finsen suggested the use of concentrated chemical light for local treatment for skin diseases, and nonconcentrated light or "light-baths" for various affections, particularly tuberculosis. The two types of treatment are entirely unlike and should often be used combined. Local or concentrated treatment aims at the destruction of the pathological cells by the use of a powerful light. By the general treatment it is sought to produce an action on the body as a whole. The whole body surface should receive as much irradiation as possible, as indicated. The carbon-arc light has proved the best type of artificial light-bath in regard to local and general treatment. Experience at this institute has proved it to be of greater value than any other artificial light, because, it is believed, it contains all the rays, and notably all the chemical rays that penetrate well into the tissues; whereas the mercury light has a linear spectrum, the lines of which are strong in the short-waved ultraviolet rays of feeble tissue penetration. Local light therapy seems to be especially indicated in the treatment of lupus vulgaris, and other tuberculous affections of the skin, fistulous cases of lymphatic and surgical tuberculosis. In lupus vulgaris the results of combined local and general light treatment have been good. Of the cases in which the affection was not more than four years old, 90 per cent were cured, with fine cosmetic results. The general light treatment, the "light-bath" is used and especially indicated in various forms of surgical tuberculosis, for laryngeal and for certain cases of pulmonary tubercu-

losis. The equipment is twofold. One arrangement consists of two lamps suspended side by side, each of 75 amperes (55 volts) direct current; the other is of three lamps, suspended likewise, each of 20 amperes (55 volts) direct current. The former is indicated for patients able to sit up, and allows for the treatment of six patients simultaneously; the latter is indicated for bed patients. Results obtained at the institute are said to be almost as satisfactory as those obtained by Bernhardt and Rollier in Switzerland. Individuals, especially children, who are suspected of having tuberculosis, and who are unable to obtain natural sunlight, should be treated with light baths. Such patients have been treated with excellent results. Photographs showing the arrangement of the lamps, so that group treatment of from four to six patients simultaneously, are submitted. The results of the treatment of lupus vulgaris of the face and of tuberculous cervical lymph nodes, by the combined (that is, local and general) light methods are also shown.—*Actinotherapy at the Finsen Institute, Copenhagen, A. Reyn, Brit. J. Tuberc., January, 1928, xxii, 1.*—(*H. McL. R.*)

Phototherapy in General Hospital.—This is an account of the organization and running of the light department of the London Hospital. Cases of pulmonary and laryngeal tuberculosis are not accepted, as such cases should be treated in institutions devoted to this special work. It is found impossible to take on cases, however suitable, unless and until arrangements have been made to ensure the regularity and continuity of their treatment. In certain cases, when it appears that the food is insufficient, the nurse in charge has power to draw upon a small private fund by which children who need them have an allowance of milk and other necessities. Some patients who live at a distance have their fares paid by the local tuberculosis authorities. By arrangements with the guardians of neighboring districts some of the children from provincial areas are lodged in local Poor-law hospitals and attend daily. As a result of light treatment 70 per cent of the patients with lupus vulgaris have been cured, 11 per cent require occasional treatment, 16 per cent are classed as improved, and only 3 per cent remain uninfluenced by the treatment. Three cases are reported in which signs of pulmonary tuberculosis were developed and revealed by light treatment.—*Some Observations on Light Treatment at the London Hospital, J. H. Sequira and W. J. O'Donovan, Lancet, November 26, 1927, ccxiii, 1118.*—(*B. T. McM.*)

Ultraviolet Radiation Clinic.—The three lamps considered necessary for the equipment of an ultraviolet radiation clinic are the carbon-arc lamp, preferably the long-flame arc, one air-cooled mercury-vapor lamp, and one water-cooled mercury-vapor lamp (Kromayer). The difference of opinion in regard to efficient and sufficient apparatus is due to the fact that no standard technique as yet exists. The choice of apparatus should depend upon the size of the clinic to be equipped and the number and types of patients to be treated. A dogmatic view cannot be given in answer to what source of ultraviolet radiation is the best, the carbon-arc lamp or the mercury-vapor. Each lamp has its advantages and disadvantages. America apparently favors the mercury-vapor; Denmark and England the carbon-arc. The choice of apparatus also must depend upon the room-space available. One of the advantages of the carbon-arc lamp is that a number of patients can be treated at the same time. When this lamp is used the minimum-sized room should have a diameter of 12 feet. Ventilation should be efficient, yet the patient should not be chilled. The lamp suspended from a stand is found more suitable than one suspended from the ceiling. There are two types of carbon-arc lamps, the long-flame and the Finsen. An erythema is produced more rapidly by the long-flame type, and Griffith and Jack have demonstrated the greater efficiency of this type. It is not essential that the arc should be of the direct current type. Of the different electrodes, the "white-flame" ones seem most serviceable and are recommended. The average erythema dose at four feet with these electrodes on the thirty-ampere arc is ten minutes. The bactericidal power of the tungsten-cored electrodes for staphylococci is forty seconds, at four feet, while with the white flame it is eight minutes. The mercury-vapor lamps are of two chief types, the air-cooled and water-cooled or Kromayer type. The difference between the alternating and the direct-current apparatus is not essential; the latter is said to be cheaper but the former is said to give a larger output of ultraviolet. The advantages claimed for the mercury-vapor apparatus for general irradiation are (1) the exposures are shorter, (2) absence of heat and fumes, (3) cheaper in operation, and (4) less floor-space required. The Kromayer apparatus is the most useful for local treatment. It is claimed that it has strong bactericidal power. For measuring the fall in the efficiency of the lamp, it is best for the operator to do an erythema test on himself at intervals. With the apparatus described it should not be difficult to treat any condition in which ultraviolet irradiation

is indicated.—*The Equipment of an Ultraviolet Radiation Clinic, M. Weinbren, Brit. J. Tuberc., October, 1927, xxi, 191.—(H. McL. R.)*

Efficiency of Various Lights.—During the past year the Committee on Public Health of the Massachusetts Medical Society has studied the effect of various forms of radiant energy, with a view to adding to present knowledge of the therapeutic usefulness of so called ultraviolet lamps. The uncertainty of clinical opinions in response to the Committee's questionnaire led to the preparation of this article. The efficiency of sources of radiation is measured by the ratio of output to input, but most of these items cannot be given fixed numerical values. Sunlight has serious drawbacks, for neither its intensity nor quality is constant and there is no way of controlling fluctuations. Finsen, finding the sun at Copenhagen inefficient for treating lupus, developed the carbon-arc as a source of therapeutically active ultraviolet radiations when its rays were concentrated with lenses. There was, however, found to be a greater fraction of long invisible heat-rays than in sunlight, which had to be filtered out by passing the beam through quartz-windowed cells containing running water. Some shorter radiations were also included. In practice the problem is complex, and it is certain that many an unknown physiological effect of radiation has yet to be discovered. It is, therefore, not surprising that the clinician's choice of a lamp is often determined by the salesman's persuasiveness. We must get clearer notions of the characteristics of the radiant sources at disposal and consider both quantity and quality of radiations. There may be undesirable kinds of rays to be eliminated and their filtration may add undesirable complexity to the apparatus and impair its efficiency. *Incandescent Lamps with Tungsten Filaments:* This is inefficient as a source of visible radiation and most of the radiant energy is in the infrared or heat region. It is essentially a source of heat rather than light. It is true that the spectral energy curve does not fall to the horizontal axis until beyond the limit of the solar spectrum, and this fact has been used by those interested in its sale as evidence of usefulness as a source of ultraviolet radiation. But the fraction of short wave-lengths is so small as to be negligible. *Blue Sky:* Spectral energy, luminosity, and photographic action curves are shown diagrammatically. The short wave-length maximum mounts to a much greater height than does that of the incandescent lamp, because there are more available photochemically active rays. This agrees with the known fact that the blue sky is a much more efficient source for photographic purposes than the tungsten lamp, and should make the clinician wary of purchasing apparatus for ultraviolet treatment which uses incandescent lamps. It is also shown that for an incandescent lamp to have a luminosity equal to blue sky would so increase heat radiation as to make high-capacity filters necessary. Data on the therapeutic efficiency of various regions of the spectrum is much to be desired, particularly their specificity in producing certain effects. Meanwhile Bovie has made a few preliminary studies. The curve for a certain type of pigmentation shows a maximum at wave length 0.32. If it be assumed that radiations of this wave length are used with 100 per cent efficiency, those with a wave length of 0.325 have only a 50 per cent efficiency. For this effect, direct sunlight radiations surpass considerably the artificial sources compared, and if artificial sources are used to produce this particular effect a filter to cut out radiations shorter than 0.29, which cause surface burning, might be advisable. On the other hand, study of another physiological effect showed that it was produced only by rays shorter than 0.31, and by those as short as 0.22, and that the artificial source was more efficient than sunlight. Assuming that the clinician prescribes radiation intelligently and only when indicated, the efficiency of the source will be determined, first, by the intensity and amount of radiant energy emitted in the spectral region of the desired activity, second, by its ease of clinical application, and, third, by the original purchase price plus cost of repairs and replacements. Until the limits of the effective spectral regions are charted we have only clinical empiricism to guide us. Some tables are appended showing spectral component in percentage of sunlight, of radiation from various sources. The white flame arc, using 90 amperes, seems to best approximate the sun's luminosity, the yellow flame at 30 amperes its shorter rays. At Flagstaff, Arizona, sunlight is nearly 50 per cent more powerful than at sea-level, Washington, D. C. Another set of tables shows the transmission of ultraviolet solar rays through various glasses, Corex and fused quartz being most efficient, helioglass and vitaglass about 50 per cent efficient, Cel-o-glass 20 to 30 per cent, and the other samples of glass almost nil.—*The Comparative Efficiency of Sources of Radiation Used in Therapy, W. T. Bovie, Boston M. & S. J., February 9, 1928, cxcvii, 1509.—(A. P.)*

Penetration of Ultraviolet Rays.—With the aid of spectrophotographs and a thermopile of great sensitivity, experiments were performed on rabbits, cats and dogs under deep general anaesthesia to determine the penetration of various ultraviolet rays through living animal tissue, particularly the skin. An incision was made through the shaved skin of the epidermis and the barrel of the spectrograph was inserted under the skin. With the normal circulation going on, the skin was irradiated from outside with ultraviolet lamps, both the Alpine Sun and Kromayer lamps being used, and spectrophotographs of the transmitted rays were obtained on the other side. The spectroscope was also inserted into the peritoneal cavity of the rabbit, and penetration through the abdominal wall measured. Some unexpected results were obtained, in view of the general opinion hitherto that the shorter ultraviolet rays rarely penetrate more than 0.1 mm. through the skin. While the range of visible light waves extends from 7700 angstrom units at the red end of the spectrum to 3900 units at the violet end, spectrophotographs taken by this method showed that invisible or ultraviolet rays of 3025 angstrom units were registered on the plate when the thickness of the skin was a millimetre or even more, and the exposure lasted for a minute. In a two-minute exposure at a distance of 20 cm. for the Alpine Sun lamp lines in the region of 2803 angstrom units were registered. After a two-minute exposure to the Kromayer lamp at a distance of 5 cm. the line 3130 was registered through the abdominal wall of a rabbit. A comparison with dead and preserved skin showed a marked difference in transmission, skin which transmitted 3025 angstrom units before transmitting only 3650 units after treatment with formaldehyde. Dead skin treated with a lipoid solvent transmitted as well as living skin. Experiments with fresh human skin obtained after surgical operations, showed transmission of the wave length 3650, still below the visible length, through skin 2.2 mm. thick. Comparisons between white human skin and the skin of the negro showed that the latter absorbed practically all the shorter rays. Intravenous injections of eosin, which absorbs ultraviolet rays, abolished registration on the photographic plates. In order to obtain quantitative data and to determine penetration of individual wave-lengths, a large monochromator was used to focus light rays on the skin, and a second set of lenses conducted the transmitted rays to a sensitive thermopile. It was found that transmission of some of the shorter ultraviolet rays is much greater than that of the longer, contrary to previous experience with dead skin. The whole series of experiments proved that penetration of ultraviolet rays through living skin and other tissue is much greater than has hitherto been supposed.—*The Penetration of Ultraviolet Rays into Live Animal Tissues, D. I. Macht, W. T. Anderson and F. K. Bell, J. Am. M. Ass., January 21, 1928, xc, 161.*—(*G. L. L.*)

Sources of Clinical Ultraviolet Rays.—Ultraviolet rays, comprising the region of the spectrum from 3900 to about 1850 angstrom units, may be conveniently divided into three zones: the *vital ultraviolet*, between 2900 and 3200 angstrom units, which zone is present in summer noon sunlight, does not pass through ordinary window glass, and is essential for the normal growth of babies, for activation of foods and oils, for effecting normal calcium metabolism in pregnant women, for causing sunburn and sun tan; the *intravital ultraviolet*, the zone between 3900 and 3200 angstrom units, which passes through ordinary window glass, is present in sunlight, but has no known health giving value for animals; and the *extravital ultraviolet*, consisting of radiation shorter than 2900 angstrom units, not found in sunlight, but emitted by a number of artificial sources, and very effective in curing rickets and in activating cholesterol, foodstuffs and oils. In an attempt to measure the quantitative relative intensity of the component wavelengths in these three zones available in practical sources of light under definite operating conditions, a bismuth-silver thermopile and a galvanometer were used to record the energy of light spectralized by a system of quartz lenses and prisms, through a filter of Corning corex, G 986-A, transmitting only light from 4100 to 2450 angstrom units. Measured in units of ergs per second per sq. mm. of area at 40 inches, the quartz mercury-arc, direct current, with voltage of 75, amperage of 3.4, and arc-length 55 mm., gave approximately 11 units in the intravital, 8.6 in the vital and 4 units in the extravital zones. The alternating current quartz-mercury arc, with voltage 150, amperage 5 and arc length 120 mm., gave respectively 9.4, 11.3 and 6.3 units approximately. The white flame, therapeutic carbon, with voltage 35, amperage 17, arc length 15 mm., gave 7.8, 1.12 and 0.4 units. The yellow flame, calcium fluoride carbon, with voltage 40, amperage 16 and arc-length 12 mm., gave 4.3, 1.2 and 0.44 units in the various zones. With the energy in the various zones of the ultraviolet measured in this way, more accurate clinical observations are available, with more accurately formulated dosages.—*Quantita-*

tive Study of Clinical Ultraviolet Sources, H. Goodman and W. T. Anderson, J. Am. M. Ass., March 3, 1928, xc, 671.—(G. L. L.)

Transmission of Ultraviolet Rays through Glass.—Previous studies have depended on photographic methods of determination, which are reliable for quality but unreliable in quantitative studies except with very special precautions. In this study a series of quartz lenses and prisms were arranged so that selection of certain wavelengths was possible. The source of light was a scientific model of the mercury-vapor arc in quartz, operated in vertical position at 3.5 amperes, 80 volts, direct current. The selected energy-radiation was measured by a sensitive bismuth-silver thermopile of the Hilger type and recorded on a Leeds and Northrup galvanometer. The energy of the desired region of the spectrum was determined with the glass in front of the thermopile and without the glass. The ultraviolet is that region of the spectrum beginning at 3900 Angstrom units contiguous to the visible violet and extending to the limits of air transmission about 1850 Angstrom units. The spectrum limits of ordinary window glass may be taken as approximately 3200 Angstrom units. Since the rays of the sun extend only to 2900 Angstrom units under optimum conditions at noon in summer, it is only this limited zone of "vital ultraviolet" which requires study. The radiations between 3100 and 2925 A. U. were those measured in this study. Most of the samples of glass were supplied by manufacturers but were not specially selected with a view to testing. Each glass was carefully cleaned and polished and its thickness measured. Previous accurate determinations of solar ultraviolet have been made by Dorno, at Davos, Switzerland, and by Fabry and Busson at Marseilles. Dorno found there was about 800 times more ultraviolet from the sun on a clear July day than on one in January. Measurements made in the industrial section of Newark, polluted with smoke and dust, demonstrated even during the summer on a clear day an almost total absence of "vital" intraviolet. Rainy and cloudy days further deplete this. It must also be remembered that, in congested districts where many large buildings are crowded together, even southern and western exposed windows receive light mostly by reflection and that construction materials are poor reflectors for the short ultraviolet. Whether the use of any special glass in such rooms is of appreciable value, regardless of its transmitting qualities, is very doubtful. In this study fused quartz was found to transmit 87 per cent of the incident light in the zone mentioned, corex (clear) nearly 70 per cent, vioray about 56 per cent, and vitaglass 42 to 49 per cent. Celloglass transmitted considerably less, pyrex only 11.1 per cent, and "quartz lite" none at all.—*Quantitative Study of Ultraviolet Transmitting Glasses, H. Goodman and W. T. Anderson, Jr., Boston M. & S. J., January 12, 1928, cxcvii, 1316.—(A. P.)*

Transmission of Ultraviolet Rays.—One objection to the use of window glass for the transmission of ultraviolet rays is that the better of the glasses lose a large fraction of their transparency on prolonged exposure. A practical and cheap material which serves the same purpose is cellophane, which requires a supporting screen, as the material is only 0.05 mm. thick. After exposure for a year to ultraviolet transmission, however, it was found that its transparency had dropped but slightly, from 70 to 60 per cent in the curative region near wave length 3000 angstrom units.—*A Practical Window for Transmitting Ultraviolet Rays, A. H. Pfund, J. Am. M. Ass., July 7, 1928, xci, 18.—(G. L. L.)*

Ultraviolet Irradiation and Bactericidal Powers of Blood.—An investigation was made to test the bactericidal property of the blood in various individuals before and after a course of routine quartz-lamp irraditions as ordinarily used in treatment. Because of the various factors entering into treatment by solar irradiation, artificial sources of radiation afford a better opportunity for studying the specific action of ultraviolet rays. Three groups of patients were selected: first, those whose outdoor life was much limited because of deformities; second, those convalescing from recent infections; third, patients with rickets. The changes in antibacterial properties of the blood were tested by its killing power *in vitro* for certain test-bacteria before and after irradiation. It was found that daily lamp treatment over a period from two to eleven weeks does not as a rule improve, but rather leads to lowered bactericidal power of the blood, especially in those patients suffering from chronic infections and postinfectious conditions. Normal persons, free from infection, are on the other hand apt to show improved bactericidal properties. Normal rabbits showed in all cases a favorable response to daily irradiation. The increased or reduced bactericidal property of the blood seems to depend largely on the leucocytic reaction of the body. An increased number of leucocytes, especially polymorphonuclears, is associated with improved killing power for cocci; a leucopoenia is associated with a

lowered killing power. Different individuals may show the same number of leucocytes, and the opposite antibacterial response; this means a high constancy in the antibacterial function of the leucocyte in one individual, but differences in the leucocytic ability of different individuals. It was noted that the pigment of the skin apparently played no important part in this bactericidal action. In the matter of treatment, the response of the body should be controlled by either the bactericidal test or the leucocytic reaction.—*The Action of Ultraviolet Irradiation on the Bactericidal Property of the Blood, J. E. Gonce and K. Kassowitz, J. Am. M. Ass., January 28, 1928, xc, 280.*—(*G. L. L.*)

Ergosterol and Ultraviolet Rays.—Varying conceptions of authors, writing since 1919 as to the cause and cure of rickets, are discussed. Experiments, carried out and mentioned in some detail, apparently indicate that it is not any particular food substance or given vitamine that prevents rickets, but in all probability the ultraviolet ray is the actual antirachitic principle. Experiments also have shown that ergosterol has marked absorptive power for ultraviolet rays, and that this substance after irradiation will cure or prevent rickets in rats in doses of 0.001 mgm. per rat per day. Substances rich in A and D factors or vitamines are believed to exert a beneficial effect on tuberculosis; fresh air and sunshine are proved methods of treatment. Whether their effect depends upon the presence of either vitamine can hardly be established until it can be demonstrated that there is a relationship between such a body and the bacillus, or the manner in which the tissues react to its presence. Further research along such lines might furnish knowledge that would prove beneficial in the treatment of tuberculosis.—*Ergosterol and Ultraviolet Rays, E. Holmes, Brit. J. Tuberc., October, 1927, xxi, 200.*—(*H. McL. R.*)

Artificial Heliotherapy.—This is a record of a complete year's work at the Artificial Sunlight Clinic at the Carnegie Institute. The patients were chiefly children under five years of age, but a few mothers also received treatment. *Conclusions:* Of the value of ultraviolet light treatment for rickets there can be no question; improvement can be obtained rapidly and surely in all cases. Most cases with a strong catarrhal tendency or debility following infectious diseases, including pneumonia, show marked improvement. It is useful in infantile eczema and in alopoecia. The results among children treated in the observation ward of the institute and given light treatment are similar. Wasted infants suffering from chronic dyspepsia from various causes do not, however, benefit to any marked extent. Even in these, however, the use of light treatment is valuable in order to prevent the onset of rickets.—*The Results of Ultraviolet Light Treatment, E. Cassie, Lancet, November 26, 1927, ccxiii, 1121.*—(*B. T. McM.*)

X-Ray Treatment of Pregnant Tuberculous Women.—The author reports on the roentgen-ray treatment of pulmonary tuberculosis in pregnant women. In 9 of the cases there was improvement, and in 3 a progression of the disease.—*Gestation und Tuberkulose, Schultze-Rhonhof, Arch. f. Gyn., 1927, cxxxii, 301.*—(*H. J. C.*)

Treatment of Tuberculosis with Gold.—In 1920 at the St. Blasien Sanatorium 10 patients with progressive pulmonary tuberculosis were treated with gold preparations. Of these none was cured, 5 were improved, and 5 were unimproved. At the same institution similar results were later obtained on a slightly larger group of patients. Focal reactions in the lung could not be detected after treatment, but in patients with laryngeal tuberculosis great redness and infiltration, difficult swallowing and hoarseness appeared. The improvement that comes in pulmonary tuberculosis from treatment with gold preparations is not much different from that associated with "climatic cure." The frequently observed reduction in the number of tubercle bacilli, however, is worthy of mention. As irritation-therapy, but not as bactericidal therapy, the proper administration of the drug is of value, even if expectations were not fulfilled. It is valuable especially because it may be used in fresh exudative disease. Productive laryngeal tuberculosis reacts readily to gold preparations and offers no difficulties. Treatment with gold is to be thought of as a type of "irritation-therapy." Overevaluation of the results of treatment, especially after uncritical application, is to be warned against. There are unquestionably dangers in carrying out the gold treatment, but these may be kept within moderate limits by careful doses, and by administration only when correctly indicated and by continued, close observation of the patient. These cannot be absolutely avoided, however. The application of Moellgaard's serum in treatment with sanocrysin is both unnecessary and dangerous.—*Erfahrungen mit Goldtherapie bei Tuberkulose, W. Unverzagt, Deutsche med. Wchnschr., 1927, liii, 1985.*—(*H. S. W.*)

Treatment of Tuberculosis with Gold.—In the treatment of 100 cases of moderately severe, open pulmonary tuberculosis the individual immunobiological state was used as a guide rather than the extent or form of tuberculosis. This was tested by repeated tuberculin tests, and cases with absolute anergy as well as marked allergy were excluded. Krysolgan, triphal and aurophos were used and found to be of about equal value. Treatment was begun with 0.5 mgm., the second injection being given 1 to 2 weeks later with double the dose, and gradually to a final 0.1 gm. A complete treatment included from 6 to 8 to 10 injections; after an interval of several months depending upon the condition of the patient, it was repeated. Of the 100 cases treated, 17 became free from bacilli and 42 were markedly benefited.—*Über Goldbehandlung der Lungentuberkulose, C. Moewes, Ztschr. f. Tuberk., 1927, xlix, 263.*—(*H. J. C.*)

Treatment of Tuberculosis with Gold.—As one of the originators of the gold treatment of tuberculosis, the author defends this mode of therapy. The blame for its present disrepute is placed upon sanocrysin, which is not a new agent, according to the author. It gives rise to many disturbing effects, so that the favorable action of the gold cannot display itself. Compared with other gold preparations, sanocrysin is not an improvement, but rather possesses disadvantages.—*Die Goldtherapie der Tuberkulose, G. Spiess, Beitr. z. Klin. d. Tuberk. 1927, lxvi, 490.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis with Solganol.—Solganol, an alkali salt of a complex auric acid, the sulphoxylate, contains 36.5 per cent of gold. It is well tolerated, and can be given in greater concentration than krysolgan. With careful dosage, productive and productive—cirrhotic forms of pulmonary tuberculosis are very satisfactorily influenced. Exudative processes are not suitable for treatment, nor are cases complicated with intestinal tuberculosis. Good results were obtained when solganol was combined with artificial pneumothorax. In febrile conditions treatment is interrupted until an afebrile period recurs.—*Über Solganalbehandlung der Lungentuberkulose, G. Hacker, Beitr. z. Klin. d. Tuberk., 1927, lxvi, 641.*—(*H. J. C.*)

Treatment of Experimental Tuberculosis with Gold.—The authors endeavored to repeat the experiments of Madsen and Morch who infected rabbits with bovine bacilli and obtained favorable results from gold treatment. Their results, however, were entirely negative after using the same type of bacilli intravenously and treating with various gold preparations, including sanocrysin, krysolgan, and sodium aurichloride.—*Goldsalz, behandlung der experimentellen Kaninchentuberkulose, O. Bang, Ztschr. f. Tuberk., 1927, xlvii, 286.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis with Triphal.—This is a brief report on the treatment with triphal of 15 patients with bilateral pulmonary tuberculosis. In 6 patients the clinical improvement was satisfactory, and in 9 cases no beneficial effect was noted. No ill effects were observed.—*Erfahrungen mit Triphal bei Lungentuberkulose, L. Brings, Wien. klin. Wchnschr., December 22, 1927, xl, 1609.*—(*M. P.*)

Treatment of Tuberculosis with Triphal.—If tuberculosis of the larynx and lungs be treated with small doses of triphal, considerable subjective and (frequently) objective improvement ensues. Doses in the present report ranged from 0.5 cgm. to 0.33 gm. in a 1 per cent solution, and were given every two weeks. Of 19 pulmonary cases treated from twelve to eighteen weeks, 5 had cavities and all had a great deal of disease; 15 had tubercle bacilli in the sputum, 6 had had phrenicotomy, and 4 had laryngeal complications. Of the 15 with positive sputum at the beginning, 14 still had bacilli at the end of treatment. One who had been negative became positive during treatment. After injection there was some increase in local symptoms and in fever. Subjective improvement occurred in all, marked recession of cough and expectoration was observed in four, and an increase in weight in all but one. Even though such changes in symptoms are those that usually appear in the course of sanatorium treatment, it seems justifiable to attribute the changes in these patients to the drug. The use of large doses of the drug is decidedly contraindicated in laryngeal tuberculosis because of the danger of metastasis and local spread of the disease. In such a condition, however, very small doses at intervals of eight or ten days yield satisfactory results.—*Behandlung der Lungen- und Kehlkopftuberkulose mit Triphal, H. Schmidt, Deutsche med. Wchnschr., 1927, liii, 1986.*—(*H. S. W.*)

Treatment of Tuberculosis with Triphal. The use of triphal for three years in the treatment of tuberculosis has taught several things. Aqueous solutions are preferable for administration. When fresh,

these are nontoxic and they should not be used except when fresh. The drug is administered in doses ranging from 0.01 to 0.1 gm. in a bulk of 2 to 5 cc. of fluid, which should be very slowly injected intravenously. The interval between doses, and the actual amount at each dose are individual matters. The drug may be given to mild or very severe, exudative cases with salutary results. Frequently the drug caused tubercle bacilli to disappear from the sputum, and fresh areas of disease to become encapsulated. In one case of miliary tuberculosis it led to a short remission; in another similar case no demonstrable influence was detectable. It is not only contraindicated, but is sometimes actually helpful in laryngeal tuberculosis. It is also beneficial in tuberculosis of the eye and, as appears from reports of other workers, in that of bones, joints, spleen and skin. It does not help intestinal tuberculosis. Injections should be given weekly. Focal and general reactions may occur if the interval between injections is not right. These resemble mild tuberculin reactions, and last from three to five days with a slight or even considerable rise in temperature. If they do occur, one may lessen the dose and increase the interval between doses. It is not uncommon to observe slight grades of albuminuria during treatment. Neither haemoptysis nor high fever are contraindications. The drug exerts a favorable effect when given after collapse of the lung (either by pneumothorax, phrenicotomy or thoracoplasty). Irrespective of what bactericidal properties triphal may be shown to possess in test-tube experiments, there is reason to believe that in the human body the action of the drug is to stimulate proliferation and encapsulation and promote absorption of exudative or necrotic matter rather than to kill the tubercle bacillus. After triphal injections there frequently appears a flaring up of sites of Pirquet tuberculin tests. Focal reactions (eyes, larynx, etc.) are frequently seen following an injection.—*Die Behandlung der Tuberkulose mit Triphal, E. Leschke, Deutsche med. Wchnschr., 1927, liii, 1983.*—(*H. S. W.*)

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